

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-489

Anonymous Referee #2

Referee comment on "Comparing the ice nucleation properties of the kaolin minerals kaolinite and halloysite" by Kristian Klumpp et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-489-RC2>, 2022

Review of the manuscript "Comparing the ice nucleation properties of the kaolin minerals kaolinite and halloysite" by Klumpp et al.

General comments: The extensive work by Klumpp et al. describes the heterogeneous ice nucleation properties of two mineral dust types, kaolinite and halloysite, that are chemically identical and have the same crystal structure, but differ in their morphologies. Comparison of their freezing properties before and after physical modification by milling showed that the morphology plays an important role affecting the chemistry as well. This study has an important contribution to the ice nucleation field of study and it improves our understanding of why a certain surface produce better ice nucleating sites compare to another. The manuscript is within the scope of ACP. The experiments were well designed, the results are well presented and well interpreted. The introduction is very thorough and focused. I recommend to publish the manuscript in ACP after the authors will address the following comments:

Major comments :

- The authors suggest the notion of surface hydroxylated edges as ice nucleating sites, however, the current work did not provide a direct evidence for that. So, there is no mechanism which was found and I think this should be highlighted in the conclusion and discussed. Is there scientific way to establish this for example? A way to quantify

that?

- What are the atmospheric implications? kaolin particles are common in the atmosphere and will atmospheric transport or cloud processing can affect its ice nucleating abilities in light of the results of this study?
- In many cases along the manuscript the data presented without the uncertainties. Please make sure you report the uncertainties.
- There is no information about sample preparation and measurement process for surface area in the BET. Degassing was done? At which conditions? How many times each powder was measured?

Minor comments:

- A figure describes kaolinite and halloysite structures can be included in the text or in the supplementary.
- Line #71: What is the source of difference between results of H₂O and N₂ surface area and pore size?
- Line #249: Please detail to which sample variability you refer to?
- Line #250: Please explain what is the cause for the 1 K difference in the homogeneous freezing temperature between the different measurements.

Technical comments:

Line #83-84: Please provide a reference.

Line #184: For uniformity, notice the use of backslash in temperature change rate here while in the rest of the text there is a use of superscript.

Fig 2: missing units to the y-axis for Thet.

Fig 4: missing units to the y-axis for Thet.

Fig 8. Missing bracket in the caption.

Fig 9. Missing bracket in the caption.